

Notice of Allowability

Application No.

10/812,420

Applicant(s)

MISAWA ET AL.

Examiner

Kuo-Liang Peng

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1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/10/06 Response.
2. ☒ The allowed claim(s) is/are 1-4 and 6-13.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 7. <input type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____. |

DETAILED ACTION

1. Applicants' response filed October 10, 2006 is acknowledged. Now, Claims 1-4 and 6-13 are pending.

2. Double patenting rejection(s) in the previous Office Action (Paper No. 080506) is/are removed.

The claims of the present invention have been amended to extent that the double patenting rejections are no longer sustainable.

3. Claim rejection(s) under 35 USC 103 in the previous Office Action (Paper No. 080506) is/are removed.

4. The "X" references cited in the international search report are not relied upon because of the following reason:

EP 1 260 991 does not teach or fairly suggest the use of an **onium** catalyst. In addition, it teaches that the porogen is removed under **non-oxidizing** atmosphere at a temperature **higher** than the thermal curing temperature of the polysiloxane ([0076] and Examples), and does not teach or fairly suggest the claimed heat treatment step of the pore-forming agent removal.

Allowable Subject Matter

5. Claims 1-4 and 6-13 are allowed.

6. The following is an examiner's statement of reasons for allowance:

The present claims are allowable for at least the following reason(s) over the closest references: Hayashi (JP 2002-060691) and Nobe (JP 2001-098218).

None of Hayashi and Nobe, taken alone or in combination, teaches or fairly suggests the method set forth in the present invention.

Hayashi discloses a method of forming a porous film on a semiconductor substrate, which is derived from a composition comprising a polysiloxane, a porogen such as polyalkylene oxide, etc., an onium salt such as an ammonium salt and a solvent. ([0005]-[0007], [0019]-[0021], [0028], [0031], [0034] and [0042]) Hayashi further teaches the formation of a porous film (i.e., the polymerization of the polysiloxane and the decomposition of the porogen) at an elevated temperature under an **inert-gas atmosphere, oxidizing atmosphere or vacuum**. The temperature for this porous film-formation process can range from 80 to 600oC, and the process can contain different heating stages. ([0042]) However, Hayashi does not teach or fairly suggest the a **separate heat treatment** for vaporizing the

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porogen where the heat-treatment in the polymerization step is specifically carried out in an **inert-gas atmosphere** and the heat-treatment in the porogen removal step is specifically carried out in an **oxidizing-gas ambient** as set forth in the present invention. Especially, Applicants show the unexpected results in Example and Comparative Examples.

	Example	Comp. Example 1	Comp. Example 2
Porous film forming method	Method 1*	Method 2**	Method 3***
Dielectric Constant	2.45	2.95	2.95

* Method 1: a) Removing solvent under N₂; b) Curing polysiloxane under **inert-gas** atmosphere; c) Vaporizing porogen under **oxidizing** atmosphere

** Method 2: a) Removing solvent under N₂; b) Curing polysiloxane/vaporizing under **inert-gas** atmosphere

*** Method 3: a) Removing solvent under N₂; b) Curing polysiloxane/vaporizing under **oxidizing-gas** atmosphere

In addition, Hayashi does not teach or fairly suggest the removal of the porogen at a temperature **lower** than the temperature at which the polysiloxane is cured. Although Nobe teaches that it is desirable to completely decompose the porogen only after the network formation of the polysiloxane, the polysiloxane is cured at a temperature of 200-350°C, while the porogen decomposed/removed temperature is 350-500°C. ([0031], [0036] and [0037]) As such, Nobe does not cure the deficiency of Hayashi because it does not teach or fairly suggest that the

temperature of porogen removal is **lower** than that of the polysiloxane curing temperature.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kuo-Liang Peng whose telephone number is (571) 272-1091. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR

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only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

klp

December 21, 2006


Kuo-Liang Peng
Primary Examiner
Art Unit 1712